

**APPENDIX 5.8**  
**July 7, 2004 APCD's Report**

TEST REPORT

LANDFILL EMISSION MONITORING

MISSION BAY LANDFILL

APRIL-MAY, 2004



SAN DIEGO AIR POLLUTION CONTROL DISTRICT

July 7, 2004

## **Air Emission Monitoring at the Mission Bay Landfill**

The Mission Bay Landfill was operated as a municipal solid waste landfill by the City of San Diego from July 1952 to December 1959. The former disposal site occupies about 130 acres adjacent to Sea World Drive along the edge of Mission Bay to the southeast of the Sea World amusement park. In early 2004, the City of San Diego hired SCS Engineers to evaluate the current status of the closed landfill and identify any potential risks to public health or the environment. The Mission Bay Technical Advisory Committee (TAC) was created to oversee this assessment and decide if further mitigation actions are warranted. City Councilwoman Donna Frye, whose district includes Mission Bay, heads the committee. At her request, County Supervisor Greg Cox asked the Air Pollution Control District (District) to perform relevant emission tests that might assist the TAC in properly examining this site.

District Air Quality monitoring staff designed a landfill gas surface emission test plan after consulting with the City of San Diego's Environmental Services Department staff and presented the proposed procedure to the members of the TAC. In accordance with the approved plan, the District collected 24-hour air samples directly over the landfill surface at three different locations on three separate days. Concurrently, staff also collected ambient air samples at the District's El Cajon and Kearny Mesa air monitoring sites for comparison. The samples at the Mission Bay Landfill were collected in fused silica coated stainless steel sample canisters equipped with fused silica coated passive air sampling kits. This sampling system was carefully monitored to preserve sample integrity and prevented contamination during sampling.

## **RESULTS**

Three landfill gas surface sampling locations were selected, one at the northwest perimeter, one in the center of the site and the third on the southeastern portion of the former landfill as shown in Figure 1. Air samples were collected on April 14, April 18 and May 3, 2004. The sampling probe inlets were placed less than a foot above the landfill surface. Proper chain-of-custody procedure was ensured during sample collection. District chemists analyzed the air samples for 27 gaseous toxic compounds (halogenated hydrocarbons) using a Gas Chromatograph/Mass Spectrometer (GC/MS) and 55 volatile organic hydrocarbons using a Gas Chromatograph equipped with a Flame Ionization Detector (GC-FID). By using such sophisticated analytical techniques, all compounds of interest were able to be detected at very low-levels.





California Health and Safety Code Section 41805.5 has identified ten, mostly halogenated, compounds associated with municipal landfill emissions. These are presented in Table 1. The Mission Bay Landfill may also have received waste containing solvents from local industrial firms. Therefore, the list was expanded to include several solvents that are presented in Table 2. The GC/MS results are presented in Attachment A. Graphs 1 and 2 show the levels of these compounds in the landfill. The levels of these compounds are almost identical at the three sampling locations in the landfill and have been averaged. This average data is compared with the levels detected at El Cajon and Kearny Mesa.

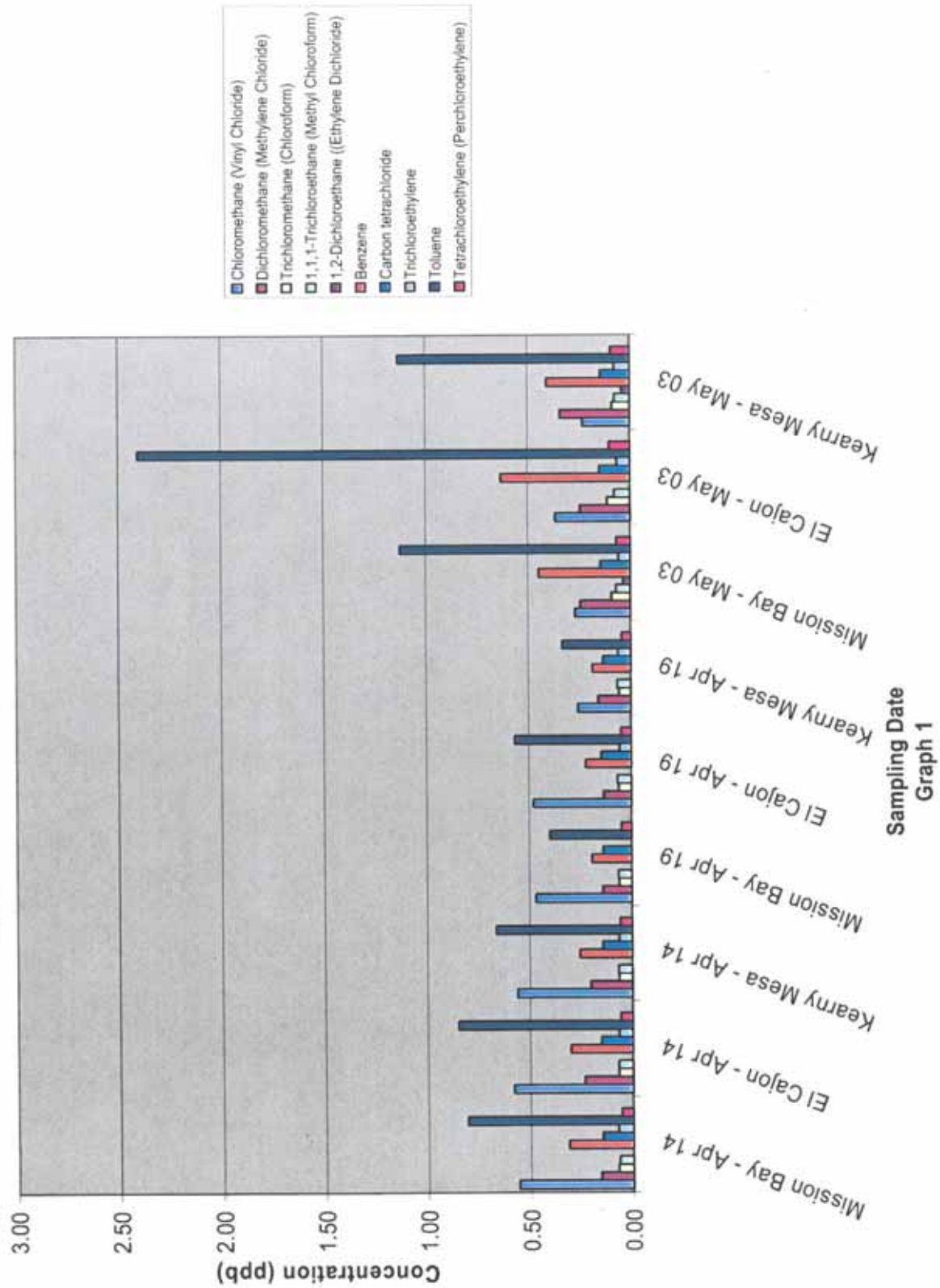
The volatile hydrocarbon data obtained by GC-FID analysis is presented in Attachment B. The three landfill sampling sites did not show any significant variations in the levels of compounds present.

Wind Roses, graphical representation of the summary wind pattern for the sampling days, are presented in Attachment C. Wind data from the downtown San Diego air monitoring site was used because of its close proximity to the landfill. The wind flow was typical of what is expected in this area with low to moderate wind speed.

<b>Table 1</b>
<b>Typical Landfill Toxics Compound</b>
Chloromethane (Vinyl Chloride)
Dichloromethane (Methylene Chloride)
Trichloromethane (Chloroform)
1,1,1-Trichloroethane (Methyl Chloroform)
1,2-Dichloroethane ((Ethylene Dichloride)
Benzene
Carbon tetrachloride
Trichloroethylene
Toluene
Tetrachloroethylene (Perchloroethylene)

<b>Table 2</b>
<b>Common Industrial Organic Solvents</b>
Dichlorodifluoromethane (Freon 12)
Trichlorofluoromethane (freon 11)
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
Chlorobenzene
m-xylene
p-xylene
o-xylene
1,4-Dichlorobenzene

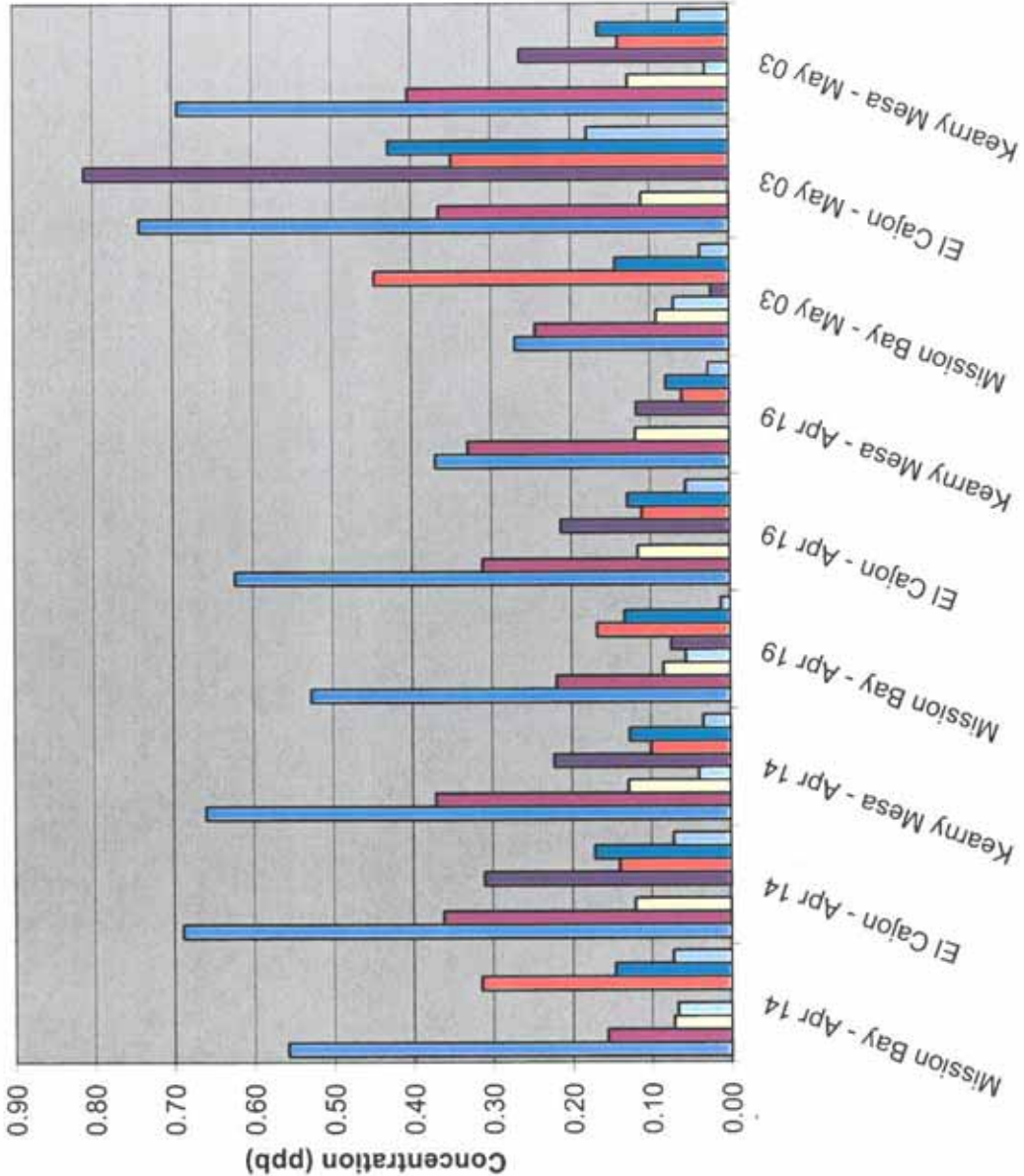
# Mission Bay Landfill Typical Toxic Compounds



DATA FOR TYPICAL TOXIC COMPOUNDS (ppb)

Compound	Mission Bay Apr 14	El Cajon Apr 14	Kearny Mesa Apr 14	Mission Bay Apr 19	El Cajon Apr 19	Kearny Mesa Apr 19	Mission Bay May 03	El Cajon May 03	Kearny Mesa May 03
Chloromethane (Vinyl Chloride)	0.56	0.58	0.56	0.47	0.48	0.26	0.27	0.36	0.23
Dichloromethane (Methylene Chloride)	0.16	0.23	0.20	0.14	0.13	0.16	0.24	0.24	0.34
Trichloromethane (Chloroform)	0.07	0.07	0.06	0.06	0.06	0.06	0.09	0.11	0.09
1,1,1-Trichloroethane (Methyl Chloroform)	0.07	0.07	0.07	0.06	0.07	0.07	0.07	0.08	0.07
1,2-Dichloroethane ((Ethylene Dichloride)							0.03		0.04
Benzene	0.31	0.30	0.26	0.19	0.22	0.19	0.45	0.63	0.40
Carbon tetrachloride	0.15	0.15	0.14	0.14	0.14	0.13	0.14	0.15	0.14
Trichloroethylene	0.07	0.07	0.06		0.06	0.06	0.06	0.06	0.07
Toluene	0.81	0.85	0.66	0.40	0.57	0.33	1.12	2.40	1.13
Tetrachloroethylene (Perchloroethylene)	0.06	0.06	0.06	0.05	0.05	0.04	0.07	0.10	0.09

## Mission Bay Landfill





DATA FOR ORGANIC SOLVENTS AND REFRIGERANTS (ppb)

Compound	Mission Bay Apr 14	El Cajon Apr 14	Kearny Mesa Apr 14	Mission Bay Apr 19	El Cajon Apr 19	Kearny Mesa Apr 19	Mission Bay May 03	El Cajon May 03	Kearny Mesa May 03
Dichlorodifluoromethane (Freon 12)	0.56	0.69	0.66	0.53	0.62	0.37	0.27	0.74	0.69
Trichlorofluoromethane (freon 11)	0.16	0.36	0.37	0.22	0.31	0.33	0.24	0.37	0.40
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	0.07	0.12	0.13	0.08	0.12	0.12	0.09	0.11	0.13
Chlorobenzene	0.07		0.04	0.06			0.07		0.03
m-xylene	0.00	0.31	0.22	0.07	0.21	0.12	0.02	0.81	0.26
p-xylene	0.31	0.14	0.10	0.17	0.11	0.06	0.45	0.35	0.14
o-xylene	0.15	0.17	0.13	0.13	0.13	0.08	0.14	0.43	0.16
1,4-Dichlorobenzene	0.07	0.07	0.03	0.01	0.06	0.03	0.04	0.18	0.06

## CONCLUSION

The sampling probes were placed very close to the landfill surface to assure capture of any potential landfill gas emissions currently being released from the former disposal site. Trace concentrations of gaseous toxic compounds, including several common industrial solvents detected at the three landfill gas surface emission sampling sites, were very low and almost identical suggesting the absence of any localized hot spots on the landfill surface. The average levels of these compounds was similar to the ambient levels found in El Cajon and Kearny Mesa showing the absence of any additional emissions produced by the former disposal site. The levels of the volatile organic hydrocarbons were also very low, consistent over the landfill surface and similar to the levels found in El Cajon and Kearny Mesa. The concentrations of some compounds measured at the surface of the Mission Bay landfill were actually lower than the levels of the same compounds measured in the ambient air of Kearny Mesa and El Cajon. This suggests the trace concentrations of air pollutants detected at the Mission Bay Landfill sampling locations are representative of normal background ambient air levels for this area of the County. These test results show no measurable levels of landfill gas are being emitted from the former disposal site.

Please contact Mahmood Hossain, Senior Air Pollution Chemist at (858) 650-4650, if you have any questions regarding this report.

Attachments

Attachment A

GC/MS Results  
For  
Gaseous Toxic Compounds

Mission Bay Landfill  
Organic Toxic Compounds (ppb\*)  
14 April, 2004

	Compounds	MB East	MB Central	MB West	El Cajon	Kearny Mesa
1	Dichlorodifluoromethane	0.66	0.63	0.63	0.69	0.66
2	Chloromethane	0.57	0.55	0.55	0.58	0.56
3	1,2-Dichloro-1,1,2,2-tetrafluoroethane	0.05	0.05	0.05	0.05	0.05
4	Bromomethane				0.05	
5	Trichlorofluoromethane	0.34	0.33	0.34	0.36	0.37
6	Isoprene	0.08	0.07	0.06	0.11	0.09
7	1,1,2-Trichloro-1,2,2-trifluoroethane	0.11	0.11	0.11	0.12	0.13
8	Dichloromethane	0.17	0.15	0.14	0.23	0.20
9	2-Butanone	0.20	0.23	0.19	0.15	0.27
10	Trichloromethane	0.08	0.07	0.07	0.07	0.06
11	1,1,1-Trichloroethane	0.07	0.07	0.07	0.07	0.07
12	1,2-Dichloroethane					
13	Benzene	0.36	0.30	0.28	0.30	0.26
14	Carbon tetrachloride	0.15	0.14	0.15	0.15	0.14
15	Trichloroethylene	0.07	0.08	0.07	0.07	0.06
16	Toluene	0.94	0.79	0.68	0.85	0.66
17	Tetrachloroethylene	0.06	0.05	0.05	0.06	0.06
18	Chlorobenzene					0.036
19	Ethylbenzene	0.15	0.14	0.12	0.15	0.12
20	m-xylene	0.32	0.27	0.22	0.31	0.22
21	p-xylene	0.14	0.13	0.11	0.14	0.10
22	Styrene	0.07		0.07	0.06	0.06
23	o-xylene	0.17	0.16	0.13	0.17	0.13
24	4-Ethyltoluene	0.06	0.07	0.06	0.07	0.05
25	1,3,5-Trimethylbenzene				0.07	
26	1,2,4-Trimethylbenzene	0.13	0.12	0.10	0.13	0.09
27	1,4-Dichlorobenzene	0.04	0.04	0.04	0.07	0.03

\*ppb-parts per billion



Mission Bay Landfill  
Organic Toxic Compounds (ppb\*)  
19 April, 2004

	Compounds	MB East	MB Central	MB West	El Cajon	Kearny Mesa
1	Dichlorodifluoromethane	0.59	0.58	0.60	0.62	0.37
2	Chloromethane	0.46	0.46	0.48	0.48	0.26
3	1,2-Dichloro-1,1,2,2-tetrafluoroethane	0.04	0.04	0.04	0.04	0.04
4	Bromomethane	0.07	0.07	0.07	0.06	0.06
5	Trichlorofluoromethane	0.30	0.30	0.31	0.31	0.33
6	Isoprene	0.06	0.06		0.09	0.07
7	1,1,2-Trichloro-1,2,2-trifluoroethane	0.11	0.11	0.11	0.12	0.12
8	Dichloromethane	0.15	0.14	0.14	0.13	0.16
9	2-Butanone			0.16		0.23
10	Trichloromethane	0.06	0.06	0.06	0.06	0.06
11	1,1,1-Trichloroethane	0.07	0.06	0.07	0.07	0.07
12	1,2-Dichloroethane					
13	Benzene	0.23	0.18	0.18	0.22	0.19
14	Carbon tetrachloride	0.14	0.13	0.14	0.14	0.13
15	Trichloroethylene				0.06	0.06
16	Toluene	0.46	0.36	0.37	0.57	0.33
17	Tetrachloroethylene	0.05	0.05	0.05	0.05	0.04
18	Chlorobenzene					
19	Ethylbenzene	0.09	0.08	0.08	0.11	0.08
20	m-xylene	0.16	0.12	0.13	0.21	0.12
21	p-xylene	0.06	0.06	0.05	0.11	0.06
22	Styrene	0.06	0.05	0.06	0.08	0.06
23	o-xylene	0.10	0.08	0.09	0.13	0.08
24	4-Ethyltoluene				0.06	0.04
25	1,3,5-Trimethylbenzene					
26	1,2,4-Trimethylbenzene	0.07	0.07	0.07	0.10	0.06
27	1,4-Dichlorobenzene	0.03	0.03	0.03	0.06	0.03

\*ppb-parts per billion

Mission Bay Landfill  
Organic Toxic Compounds (ppb\*)  
3 May, 2004

	Compounds	MB East	MB Central	MB West	El Cajon	Kearny Mesa
1	Dichlorodifluoromethane	0.67	0.66	0.65	0.74	0.69
2	Chloromethane	0.27	0.26	0.29	0.36	0.23
3	1,2-Dichloro-1,1,2,2-tetrafluoroethane	0.04	0.04	0.04	0.05	0.04
4	Bromomethane	0.06	0.05	0.05	0.05	0.05
5	Trichlorofluoromethane	0.36	0.37	0.36	0.37	0.40
6	Isoprene	0.12	0.15	0.16	0.25	0.13
7	1,1,2-Trichloro-1,2,2-trifluoroethane	0.11	0.11	0.11	0.11	0.13
8	Dichloromethane	0.26	0.25	0.22	0.24	0.34
9	2-Butanone	0.24	0.20	0.22	0.25	0.47
10	Trichloromethane	0.10	0.09	0.09	0.11	0.09
11	1,1,1-Trichloroethane	0.07	0.07	0.07	0.08	0.07
12	1,2-Dichloroethane		0.03	0.04		0.04
13	Benzene	0.50	0.43	0.41	0.63	0.40
14	Carbon tetrachloride	0.15	0.14	0.14	0.15	0.14
15	Trichloroethylene		0.06	0.06	0.06	0.07
16	Toluene	1.26	1.13	0.98	2.40	1.13
17	Tetrachloroethylene	0.07	0.07	0.06	0.10	0.09
18	Chlorobenzene					0.03
19	Ethylbenzene	0.20	0.17	0.17	0.35	0.16
20	m-xylene	0.41	0.35	0.34	0.81	0.26
21	p-xylene	0.18	0.16	0.16	0.35	0.14
22	Styrene	0.07	0.07	0.10	0.09	0.05
23	o-xylene	0.23	0.19	0.19	0.43	0.16
24	4-Ethyltoluene	0.08	0.07	0.07	0.13	0.06
25	1,3,5-Trimethylbenzene				0.10	0.03
26	1,2,4-Trimethylbenzene	0.17	0.16	0.15	0.27	0.08
27	1,4-Dichlorobenzene	0.07	0.06	0.06	0.18	0.06

\*ppb-parts per billion

Attachment B

GC-FID Results  
For  
Volatile Hydrocarbons

Mission Bay Landfill  
Volatile Hydrocarbons (ppbC\*)  
14 April, 2004

	Compounds	MB East	MB Central	MB West	El Cajon	Kearny Mesa
1	ethylene	3.6	3.1	2.6	2.7	3.0
2	acetylene	2.5	2.1	2.0	2.5	2.0
3	ethane	5.5	5.3	5.2	4.9	4.7
4	propylene	1.2	0.9	0.7	1.1	1.2
5	propane	5.1	4.7	4.4	6.7	4.3
6	isobutane	0.8	0.7	0.7	1.0	0.6
7	isobutylene/1-butene	0.6	0.4	0.3	0.5	0.7
8	n-butane	1.5	1.0	1.2	1.8	1.2
9	trans-2-butene	0.0	0.0	0.0	0.1	0.1
10	cis-2-butene	0.0	0.0	0.0	0.1	0.1
11	isopentane	3.9	3.6	3.2	4.3	2.7
12	1-pentene	0.1	0.0	0.0	0.1	0.1
13	n-pentane	1.4	1.4	1.1	1.4	1.9
14	isoprene	0.1	0.0	0.0	0.2	0.1
15	trans-2-pentene	0.1	0.0	0.0	0.1	0.1
16	cis-2-pentene	0.0	0.0	0.0	0.1	0.1
17	2,2-dimethylbutane	0.3	0.3	0.3	0.4	0.2
18	cyclopentane	0.2	0.3	0.1	0.2	0.1
19	2,3-dimethylbutane	0.5	0.6	0.4	0.6	0.4
20	2-methylpentane	1.4	1.3	1.1	1.5	0.9
21	3-methylpentane	1.5	2.4	1.2	1.6	1.4
22	1-hexene	0.0	0.1	0.0	0.0	0.1
23	n-hexane	0.8	0.8	0.5	0.8	0.6
24	methylcyclopentane	0.8	0.7	0.6	0.8	0.5
25	2,4-dimethylpentane	0.5	0.5	0.3	0.5	0.3
26	benzene	1.5	1.4	1.1	1.3	1.1
27	cyclohexane	0.4	0.4	0.3	0.5	0.4
28	2-methylhexane	0.5	0.5	0.4	0.7	0.4
29	2,3-dimethylpentane	0.8	1.3	0.6	1.0	0.6
30	3-methylhexane	1.4	1.8	0.9	1.4	1.0
31	2,2,4-trimethylpentane	2.2	2.1	1.6	2.7	1.5
32	n-heptane	0.5	0.5	0.4	0.5	0.4
33	methylcyclohexane	0.4	0.4	0.3	0.5	0.3
34	2,3,4-trimethylpentane	0.6	0.6	0.4	0.7	0.4
35	toluene	5.3	4.4	3.6	5.2	3.9
36	2-methylheptane	0.4	0.3	0.2	0.3	0.2
37	3-methylheptane	0.4	0.2	0.2	0.3	0.3
38	n-octane	0.4	0.5	0.3	0.3	0.3
39	ethylbenzene	0.8	0.7	0.5	0.8	0.6
40	m/p-xylene	2.5	1.9	1.4	2.7	1.9
41	styrene	0.0	0.0	0.0	0.0	0.0
42	o-xylene	0.9	0.8	0.6	1.1	0.7
43	n-nonane	0.2	0.5	0.2	0.4	0.3
44	isopropylbenzene	0.0	0.2	0.1	0.1	0.1
45	n-propylbenzene	0.2	0.2	0.2	0.3	0.2
46	1-ethyl 3-methylbenzene	0.6	0.5	0.4	0.8	0.5
47	1-ethyl 4-methylbenzene	0.4	0.4	0.3	0.5	0.3
48	1,3,5-trimethylbenzene	0.3	0.2	0.2	0.4	0.3
49	1-ethyl 2-methylbenzene	0.3	0.3	0.2	0.4	0.2
50	1,2,4-trimethylbenzene	0.8	0.6	0.5	1.2	0.9
51	n-decane	0.3	0.4	0.3	0.3	0.4
52	1,2,3-trimethylbenzene	0.2	0.2	0.2	0.3	0.2
53	m-diethylbenzene	0.1	0.1	0.0	0.1	0.1
54	p-diethylbenzene	0.4	0.2	0.4	0.1	0.1
55	undecane	0.3	0.4	0.3	0.3	0.3

\*ppbc-parts per billion carbon



Mission Bay Landfill  
Volatile Hydrocarbons (ppbC\*)  
19 April, 2004

	Compounds	MB East	MB Central	MB West	El Cajon	Kearny Mesa
1	ethylene	2.3	1.6	1.7	2.0	2.1
2	acetylene	1.7	1.3	1.4	1.8	1.3
3	ethane	5.1	4.7	4.7	5.1	4.3
4	propylene	0.8	0.5	0.7	0.7	0.9
5	propane	3.2	2.9	2.8	8.5	4.3
6	isobutane	0.5	0.5	0.5	0.8	0.7
7	isobutylene/1-butene	0.4	0.2	0.4	0.4	0.6
8	n-butane	0.9	0.8	0.8	1.4	1.0
9	trans-2-butene	0.0	0.0	0.0	0.0	0.0
10	cis-2-butene	0.0	0.0	0.0	0.0	0.0
11	isopentane	2.7	2.1	2.1	3.3	2.0
12	1-pentene	0.0	0.0	0.0	0.0	0.0
13	n-pentane	1.0	0.7	0.8	1.1	1.0
14	isoprene	0.0	0.0	0.0	0.1	0.1
15	trans-2-pentene	0.1	0.0	0.1	0.1	0.1
16	cis-2-pentene	0.0	0.0	0.0	0.1	0.1
17	2,2-dimethylbutane	0.2	0.2	0.2	0.3	0.2
18	cyclopentane	0.1	0.1	0.2	0.1	0.1
19	2,3-dimethylbutane	0.4	0.3	0.3	0.5	0.3
20	2-methylpentane	0.9	0.7	0.7	1.2	0.6
21	3-methylpentane	1.1	0.6	1.7	0.8	1.1
22	1-hexene	0.0	0.0	0.0	0.1	0.1
23	n-hexane	0.5	0.4	0.5	0.6	0.4
24	methylcyclopentane	0.5	0.4	0.4	0.7	0.4
25	2,4-dimethylpentane	0.3	0.2	0.2	0.4	0.3
26	benzene	1.0	0.7	0.8	0.9	0.8
27	cyclohexane	0.3	0.2	0.2	0.4	0.3
28	2-methylhexane	0.4	0.3	0.3	0.5	0.3
29	2,3-dimethylpentane	0.6	0.4	1.2	0.7	0.4
30	3-methylhexane	1.4	0.0	2.4	0.7	1.0
31	2,2,4-trimethylpentane	1.4	1.0	1.1	2.0	0.9
32	n-heptane	0.4	0.2	0.3	0.5	0.3
33	methylcyclohexane	0.3	0.2	0.2	0.4	0.3
34	2,3,4-trimethylpentane	0.4	0.3	0.2	0.6	0.3
35	toluene	2.8	2.3	2.2	3.9	2.1
36	2-methylheptane	0.2	0.2	0.2	0.3	0.1
37	3-methylheptane	0.2	0.2	0.1	0.3	0.1
38	n-octane	0.3	0.2	0.3	0.3	0.2
39	ethylbenzene	0.4	0.3	0.4	0.6	0.4
40	m/p-xylene	1.4	1.0	1.2	2.1	1.1
41	styrene	0.0	0.0	0.0	0.0	0.0
42	o-xylene	0.6	0.4	0.6	0.8	0.4
43	n-nonane	0.2	0.2	0.3	0.3	0.3
44	isopropylbenzene	0.0	0.0	0.1	0.0	0.0
45	n-propylbenzene	0.2	0.1	0.3	0.2	0.2
46	1-ethyl 3-methylbenzene	0.4	0.3	0.3	0.6	0.4
47	1-ethyl 4-methylbenzene	0.3	0.2	0.2	0.3	0.2
48	1,3,5-trimethylbenzene	0.2	0.1	0.1	0.3	0.2
49	1-ethyl 2-methylbenzene	0.3	0.1	0.2	0.2	0.2
50	1,2,4-trimethylbenzene	0.5	0.4	0.4	0.9	0.6
51	n-decane	0.2	0.2	0.2	0.3	0.3
52	1,2,3-trimethylbenzene	0.2	0.1	0.2	0.2	0.1
53	m-diethylbenzene	0.0	0.1	0.1	0.0	0.1
54	p-diethylbenzene	0.4	0.4	0.6	0.1	0.1
55	undecane	0.3	0.3	0.3	0.2	0.2

\*ppbc-parts per billion carbon

**Mission Bay Landfill**  
**Volatile Hydrocarbons (ppbC\*)**  
**3 May, 2004**

	Compounds	MB East	MB Central	MB West	El Cajon	Kearny Mesa
1	ethylene	5.4	4.4	4.4	5.7	4.2
2	acetylene	4.0	3.6	3.6	5.1	3.1
3	ethane	9.9	10.0	9.2	9.5	8.6
4	propylene	1.7	1.4	1.3	1.8	1.1
5	propane	10.3	10.2	9.6	21.4	14.6
6	isobutane	2.3	2.1	2.0	3.6	2.6
7	isobutylene/1-butene	0.9	0.8	0.9	0.9	0.5
8	n-butane	4.1	3.4	3.0	6.2	4.1
9	trans-2-butene	0.1	0.1	0.1	0.1	0.0
10	cis-2-butene	0.1	0.1	0.1	0.1	0.0
11	isopentane	8.1	6.5	6.1	16.3	9.5
12	1-pentene	0.1	0.1	0.1	0.2	0.1
13	n-pentane	2.9	2.8	2.5	5.7	5.7
14	isoprene	0.3	0.5	0.5	0.9	0.3
15	trans-2-pentene	0.2	0.3	0.3	0.4	0.1
16	cis-2-pentene	0.1	0.1	0.1	0.2	0.1
17	2,2-dimethylbutane	0.7	0.5	0.5	1.3	0.6
18	cyclopentane	0.4	0.4	0.4	0.8	0.4
19	2,3-dimethylbutane	1.1	1.0	0.9	2.5	0.9
20	2-methylpentane	2.8	2.4	2.2	6.0	2.4
21	3-methylpentane	3.4	3.0	3.0	5.3	3.6
22	1-hexene	0.1	0.1	0.1	0.1	0.0
23	n-hexane	1.6	1.5	1.3	3.0	1.7
24	methylcyclopentane	1.7	1.4	1.4	3.3	1.4
25	2,4-dimethylpentane	1.1	0.9	0.9	2.0	0.8
26	benzene	2.4	2.1	1.9	3.2	1.9
27	cyclohexane	0.8	0.7	0.6	1.7	0.7
28	2-methylhexane	1.1	1.1	0.9	2.2	0.8
29	2,3-dimethylpentane	2.0	1.7	1.7	3.7	1.7
30	3-methylhexane	2.6	2.2	2.3	3.1	1.7
31	2,2,4-trimethylpentane	3.9	3.1	3.1	8.1	3.0
32	n-heptane	0.9	1.0	0.8	1.6	0.9
33	methylcyclohexane	0.8	0.7	0.6	1.4	0.8
34	2,3,4-trimethylpentane	0.9	0.8	0.8	2.1	0.7
35	toluene	7.6	6.7	6.3	14.7	6.8
36	2-methylheptane	0.5	0.4	0.5	0.8	0.4
37	3-methylheptane	0.4	0.4	0.4	0.8	0.4
38	n-octane	0.6	0.6	0.6	0.8	0.5
39	ethylbenzene	1.3	1.1	1.1	2.5	1.0
40	p-xylene	3.9	3.6	3.4	7.9	2.6
41	styrene**	2.8	1.7	3.2	1.2	0.0
42	o-xylene	1.7	1.5	1.5	3.1	1.1
43	n-nonane	0.5	0.5	0.5	0.7	0.6
44	isopropylbenzene	0.1	0.1	0.1	0.1	0.1
45	n-propylbenzene	0.4	0.3	0.4	0.6	0.3
46	1-ethyl 3-methylbenzene	1.0	0.9	0.8	2.0	0.6
47	1-ethyl 4-methylbenzene	0.6	0.6	0.5	1.2	0.4
48	1,3,5-trimethylbenzene	0.5	0.5	0.4	1.0	0.3
49	1-ethyl 2-methylbenzene	1.5	0.5	0.4	1.0	0.3
50	1,2,4-trimethylbenzene	1.4	1.7	1.4	2.7	0.8
51	n-decane	0.5	0.6	0.5	0.8	0.6
52	1,2,3-trimethylbenzene	0.4	0.4	0.3	0.6	0.2
53	m-diethylbenzene	0.1	0.3	0.0	0.3	0.1
54	p-diethylbenzene	0.7	0.3	1.2	0.3	0.2
55	undecane	0.7	0.6	0.5	0.7	0.5

\*ppbc-parts per billion carbon

B-4

\*\*coelution produces higher styrene values



### Conversion Table

To convert from ppbc to ppb, divide by the carbon numbers of the compounds.

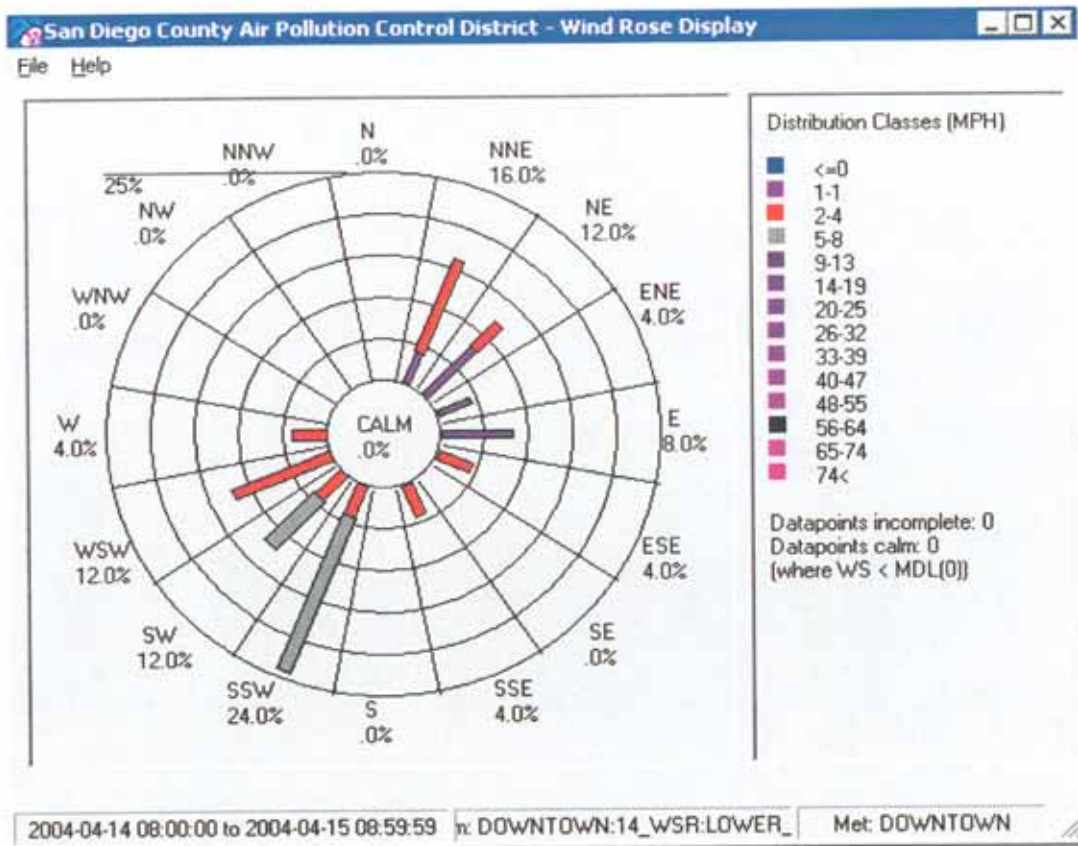
	Compounds	Carbon No.			Compounds	Carbon No.
1	ethylene	2		28	2-methylhexane	7
2	acetylene	2		29	2,3-dimethylpentane	7
3	ethane	2		30	3-methylhexane	7
4	propylene	3		31	2,2,4-trimethylpentane	8
5	propane	3		32	n-heptane	7
6	isobutane	4		33	methylcyclohexane	7
7	isobutylene/1-butene	4		34	2,3,4-trimethylpentane	8
8	n-butane	4		35	toluene	7
9	trans-2-butene	4		36	2-methylheptane	8
10	cis-2-butene	4		37	3-methylheptane	8
11	isopentane	5		38	n-octane	8
12	1-pentene	5		39	ethylbenzene	8
13	n-pentane	5		40	m/p-xylene	8
14	isoprene	5		41	styrene	8
15	trans-2-pentene	5		42	o-xylene	8
16	cis-2-pentene	5		43	n-nonane	9
17	2,2-dimethylbutane	6		44	isopropylbenzene	9
18	cyclopentane	5		45	n-propylbenzene	9
19	2,3-dimethylbutane	6		46	1-ethyl 3-methylbenzene	9
20	2-methylpentane	6		47	1-ethyl 4-methylbenzene	9
21	3-methylpentane	6		48	1,3,5-trimethylbenzene	9
22	1-hexene	6		49	1-ethyl 2-methylbenzene	9
23	n-hexane	6		50	1,2,4-trimethylbenzene	9
24	methylcyclopentane	4		51	n-decane	10
25	2,4-dimethylpentane	7		52	1,2,3-trimethylbenzene	9
26	benzene	6		53	m-diethylbenzene	10
27	cyclohexane	6		54	p-diethylbenzene	10
				55	undecane	11

## Attachment C

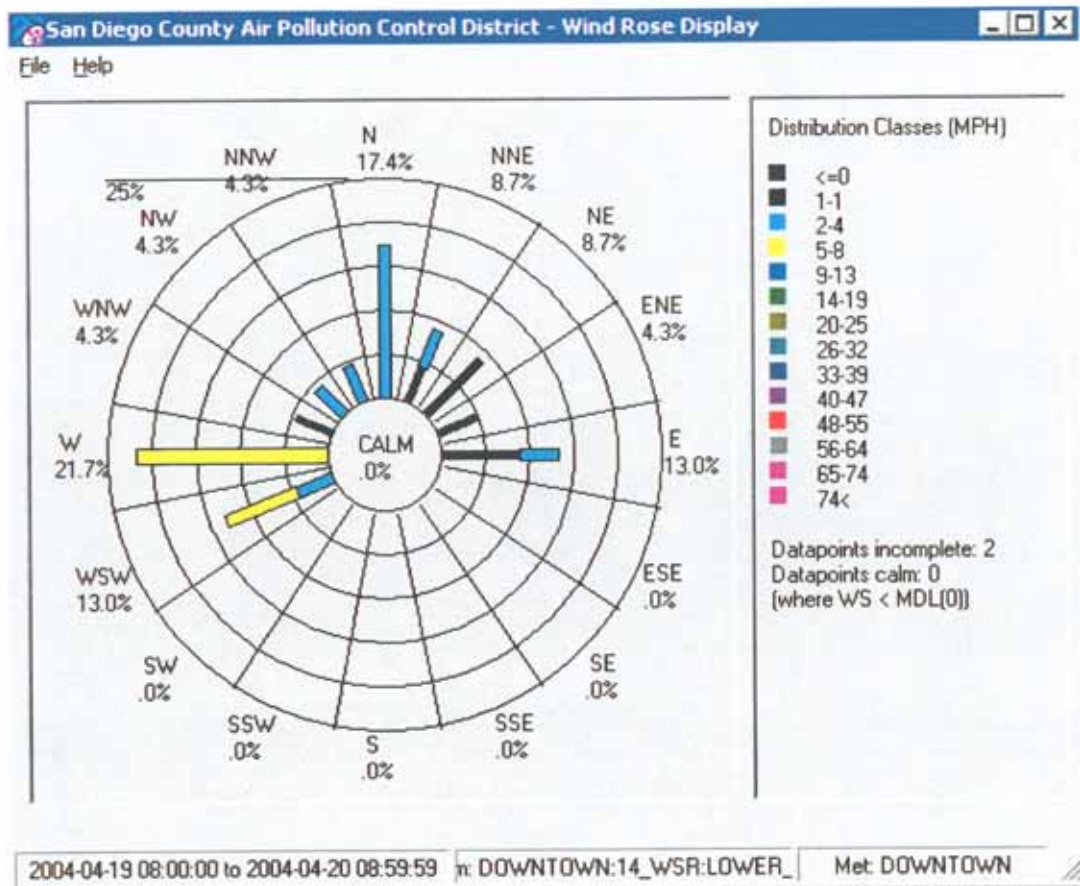
### Wind Roses



# Wind Rose for 14 April, 2004



# Wind Rose for 19 April, 2004



# Wind Rose for 3 May, 2004

